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WO 01/68155 A1

(54) Title: FRAGRANCED HYDROGEL AIR FRESHENER KITS

(57) Abstract: Kits for consumer activated hydrogel air fresheners are provided, comprising an acrylic resin, a fragranting material, and a coloring agent. The kit may take various forms, such as a container in which are packaged the appropriate amounts of resin, fragrance, and colorant, to which a volume of water is to be added. In another form, the kit may comprise a sachet or pad containing the above materials, to which water may be added to form a gel air freshener device. Further, a pad or sachet, containing the hydrogel resin and a coloring agent if desired, may be subjected to the controlled continuous feed of a water solution of a fragrance, whereby a long term, consistent fragranting is obtained.

FRAGRANCED HYDROGEL AIR FRESHENER KITS

RELATED APPLICATION(S)

5 Not applicable.

FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

10 BACKGROUND OF THE INVENTION

Technical Field

The present invention relates to air fresheners comprising a fragrance and a hydrogel composition suitable for preparation and activation by the consumer.

15 The air fresheners so prepared may take a variety of forms, determined by the specific materials provided, from gel compositions which release fragrance by evaporation, to impregnated sachets containing both resin and fragrance, which permit absorption of water, but permit release of their contents only as a vapor, to hydrogel coated cellulosic or non-woven polyolefin material which is continuously

20 fed with fresh fragrance by controlled liquid release from a reservoir, or spray hydrogel and fragrance coated pads activated by the addition of water.

Background Art

It is known that gel materials may be prepared from a variety of differing polymeric resins. It is also known that such gels may be impregnated with

25 fragrance or deodorant materials. Many such gels have been sold to the public in the form of air fresheners, usually in glass or plastic containers for placement at a location of the consumer's choice.

For example, Kliment, U. S. Patent Number 4,587,129, teaches that lower alkyl alkenoate based hydrogels may be used for entrapping flavors and fra-

30 grances, for use as solid air fresheners or sachets.

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Gould et al, in U. S. Patent Number 3,576,760, disclose preparation of dry powders of water soluble hydroxyalkyl acrylate or methacrylate polymers useful as carriers for fragrances. Such materials as orange oil may be entrapped in the polymer for release upon contact with water.

5 In U. S. Patent Number 3,567,118, Shepard et al describe dry products comprising fiber substrates impregnated with hydrophilic gels of (meth)acrylate polymers entrapping fragrance-emitting agents, which release fragrance when wetted.

Martin et al, in U. S. Patent Number 5,976,503, and Booth, Jr., et al, in
10 U. S. Patent Number 4,869,407, teach air fresheners including means for active dispensing of fragrance. In Martin et al, the dispensing means employs heat, while Booth, Jr., et al employ a bellows to dispense fragrance from an impregnated paper based wafer disc.

Semoff et al, in U. S. Patent Number 5,679,334, disclose a transparent gel
15 air freshener containing an ornamental botanical.

Fujiura et al, U. S. Patent Number 5,904,028, discloses a diffusing device containing a water-swellaable gel carrying a fragrance agent. The device comprises a packet having a water permeable portion, and the patent teaches immersing the packet in water containing a fragrance whereby the resin absorbs
20 the fragrance for subsequent release.

In addition, Pera, in U. S. Patent Number 4,906,488, discloses compositions comprising liquid-to-soft gels, of monomers, prepolymers, or polymers, referred to collectively as "mers", having a permeant therein for slow release to the environment. The patent is directed to formation of a solution of "mer" in the permeant, reacting the "mer" without encapsulation, and recovering a liquid
25 product useful in slow-release products.

One problem with such air fresheners is that the fragrance material, or the air freshening component therein, often dissipates or evaporates to some extent before being opened by the consumer, as a result of poor packaging, or exposure
30 to moisture or extreme temperature variation during shipment. Accordingly, one of the objects of the present invention is to provide an air freshener which is

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activated by the consumer at the time of use, and is thus fresh and complete until such time as it is to be used. Another object of the present invention is to provide consumer activated air fresheners of very low cost, such as may be employed by consumers of any economic status, with the greatest ease of activation.

5

SUMMARY OF THE INVENTION

The present invention is directed to a low cost, convenient, consumer activated fragrance releasing device which retains its full fragrance capacity until subjected to the addition of water to cause the reaction of components thereof, thereby forming an expanded gel from which the fragrance is released over a period of time. Thus, the invention is directed to a kit for the preparation of an air freshener device.

In its broadest sense, the invention comprises providing to the consumer a package of a dry gel precursor, a fragrancing material, and a colorant if desired, to be combined, by mixing with water, in an appropriate container. In this embodiment of the invention, a dry resinous material, impregnated with colorant, may be mixed with a solid or a liquid fragrance, followed by the addition of a relatively large volume of water. The coloring agent, may of course, be present in the fragrance, or in the water, rather than in the resin, if so desired. Upon stirring or shaking, a colored gel is formed, having the fragrance absorbed therein for release by evaporation over a period of time.

In another embodiment of the invention, a sachet is prepared, comprising a water permeable package of such material as shall permit the passage of liquid to the interior of the package, but shall not permit liquid to flow outwardly. Such materials are known for use in personal care products, such as sanitary napkins and diapers, and permit the passage of liquid in one direction only. This type of material comprises conically apertured polyethylene film, having small diameter openings designed to permit flow of liquid in one direction, but to close and prohibit back flow of the liquid. This material shall henceforth be referred to herein as having one way permeability to water. Vapors are able to escape from the microscopic openings in the surface of such materials, however, so that if a

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fragrance is enclosed within the material, the evaporation of such fragrance may occur as desired. While it is desirable that the entire sachet be of the same material, it is possible for only a limited amount of the surface area of the sachet be so characterized, provided that the remaining surface area be impermeable to water. In the sachet may be combined a dry resin, a colorant if desired, and a particulate fragrance. To activate the sachet, the consumer need only immerse it in water, or spray the surface thereof with sufficient water to activate the gel formation of the resin and dissolve the fragrance, if it is water soluble. After being contacted by a sufficient volume of water, the activated sachet may be removed and hung in any convenient location, such as in the home or auto, for the consumer to enjoy its pleasant aroma as the fragrance component thereof is released to the atmosphere. Because the sachet is manufactured of material having one way permeability to water, no excess water absorbed during activation will be released, preventing the loss of any soluble fragrance, and preventing the formation of unsightly stains, puddles, rings, etc.

In still another related embodiment of the invention, a sachet as described above, or a pad of resin and fragrance impregnated or coated material, is placed in a convenient location, such as a dish or bowl, and a controlled amount of water is released upon the surface thereof. By the term pad, applicant refers to a substrate or a cloth like structure of uniform nature, as opposed to a sachet, which comprises an outer cover surrounding separate and distinct internal contents. Such a pad may constitute a woven, e.g. cloth, or non woven fabric, e.g. felt, as well as paper. While the preferred fibrous materials are cellulosic, e.g. cotton and paper, there may be employed other fibers such as nylon, acrylonitrile fibers, polyvinyl chloride fibers, wool, and polyethylene terephthalate fibers. The preferred composite fiber comprises a paper or cardboard like structure.

In this manner, the dry resin is caused to absorb the water and form a gel, which is subsequently contacted by additional water. By control of the rate of addition of liquid to the pad, based upon the evaporation rate of the fragrance mixture from the gel, a consistent rate of fragrance release, and a no-fade dispenser thereof, is attained. In such an embodiment, the fragrance may be in a

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solid form, mixed with the resin in the pad, or alternatively, may be added in liquid form to the water which is permitted to contact the pad over time. In still a further alternative to this embodiment, the gel itself may be provided to the consumer, rather than a gel coated or impregnated substrate. In such an instance, applicant
5 envisions providing a source of water, or fragrance dissolved in water, said source having a controlled rate of release, at the approximate rate of evaporation of the water absorbed by the gel, so as to obtain a consistent rate of fragrance release. Such controlled rate of release may be obtained, for example, by gravity means, or metering of the water through a channel having holes of the appropriate
10 diameter, or by wicking means.

DETAILED DESCRIPTION OF THE INVENTION

In the simplest embodiment of the invention, the consumer is provided a kit for the preparation of an air freshener device. The basic components of the kit
15 comprise a measured amount of a dry resinous material which when mixed with water will absorb the water to form a gel. While various gel forming resins are known, the preferred material for the present invention is an acrylic resin, such as sodium polyacrylate, for reasons of stability, low cost, high liquid absorbency, and ease of use. Other suitable materials include swellable pectin, starch, or cellu-
20 lose. The resin is preferably provided as a solid particulate or powder, packaged in a plastic bag, for example, in a sachet such as disclosed previously, characterized as having one way permeability to water, or in a small vial. It is desirable that such packaging be air-tight, so as to limit the undesirable access thereto of water, humidity or air borne moisture. Further, such packaging should preferably be
25 easily openable, economically produced, and ecologically safe for disposal.

Packaged with the resin in the kit may be a fragrance material, such as a conventional air freshener fragrance, in liquid form, either as a water soluble solution, or as a solvent based solution, or in solid form, such as a freeze dried or encapsulated powder. The fragrance material may also be sprayed upon the
30 surface of the hydrogel resin. Exemplary of such fragrance materials are such fragrance ingredients which may be used to create satisfactory aromas, including

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but not limited to myrrh, cedarwood, cedrenol, cedrol, birch, methyl salicylate, fir balsam, sandalwood, santalol, juniper, benzoin, coniferyl benzoate, thyme, thymol, bay, eugenol, myrcene, basil, camphor, methyl cinnamate, cinnamon, cinnamic aldehyde, rosemary, clove, and borneol.

5 Preferably, the fragrance or air freshener is a fragrance comprising one or more volatile organic compounds which are available from perfumery suppliers such as Firmenich Inc., Takasago Inc., Noville Inc., Quest Co., International Flavors & Fragrances, and Givaudan-Roure Corp. Most conventional fragrance materials are volatile essential oils. The fragrance may be a synthetically formed
10 material, or a naturally derived oil such as oil of bergamot, bitter orange, lemon, mandarin, caraway, geranium, lavender, orange, origanum, petitgrain, white cedar, patchouli, lavandin, neroli, rose absolute, and the like.

 In addition, a wide variety of chemicals are known for perfumery, such as aldehydes, ketones, esters, alcohols, terpenes, and the like. A fragrance can be
15 relatively simple in composition, or can be a complex mixture of natural and synthetic chemical components. Synthetic types of fragrance compositions may be employed, either alone or in combination with natural oils, as described in United States Patent Nos. 4,324,915; 4,411,829; and 4,434,306. Other artificial liquid fragrances include geraniol, geranyl acetate, isoeugenol, linalool, linalyl
20 acetate, phenethyl alcohol, methyl ethyl ketone, methylionone, isobomyl acetate, and the like.

 A liquid fragrance may also be formed into a thixotropic gel by the addition of a thickening agent, such as a cellulosic material, a polymeric thickener, or a fumed silica of the type marketed under the Cabosil trademark by Cabot Corpora-
25 tion. A fragrance ingredient can also be in the form of a crystalline solid, which has the ability to sublime into the vapor phase at ambient temperatures. A crystalline fragrance material can be selected from organic compounds which include vanillin, ethyl vanillin, coumarin, tonalid, calone, heliotropene, musk xylol, cedrol, musk ketone benzophenone, raspberry ketone, methyl naphthyl ketone
30 beta, phenyl ethyl salicylate, veltol, maltol, maple lactone, proeugenol acetate, evermyl, and the like. This type of fragrance can contribute a long term air-

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treatment capability to an air freshener for use in the present invention. Among the preferred fragrances are such fragrance materials as lilac, jasmine, and rose, citrus odors such as lemon, orange, or lime, and apple type fragrances such as green, red, and golden delicious.

5 If so desired, the kit may contain a colorant to cause the hydrogel to have a distinct coloration. Such colorant may be present as a separate component to be mixed with the hydrogel resin and the fragrance, or as a pre-mixed component of either. The colorant is preferably present in a water soluble form for even distribution when the component materials are mixed with water to activate the kit, and
10 to form the gel.

 The kit may also contain a suitable container for the hydrogel air freshener, or may contain instructions as to the type of container best used for the preparation of the air freshener. The container should be a dish, bowl, jar, or such, of suitable volume and aesthetically pleasing, made of an inactive material, such as
15 glass or plastic which will not react with any of the components of the kit, or with any solvent material present in the fragrance or hydrogel resin. Glass or hard transparent plastic is preferred.

 In a preferred embodiment, the kit comprises a glass jar, such as commonly used for jar candles, containing a small plastic bag of pre-colored hydrogel
20 resin, and a small glass or plastic vial of fragrance. The kit may further comprise a plastic lid, having small openings therein, whereby fragrance may be released to the atmosphere after the hydrogel air freshener kit has been activated by the addition of water by the consumer, and reclosure with the lid to prevent accidental exposure of the contents such as by children touching or playing with the gel.
25 The lid may also be designed to enhance air flow for better fragrance delivery to the environment.

 When the consumer wishes to avail himself or herself of the air freshener device, the consumer may open the component packages, and mix the contents thereof in the container provided, or in a suitable container of the consumers
30 choice. Thus, the consumer may pre-mix the resin, the colorant if present individually, and the fragrance material. To this mixture, the consumer adds a

volume of water in accordance with instructions present with the kit, said volume of water being of a relatively large volume in comparison to the volume of resin, colorant, and fragrance present. After addition of the water, the consumer may stir, mix, or shake the liquid mixture to assure full contact of the water with all of the other components present. The fully mixed container may then be put aside for a few minutes, for the reaction and absorption of the water and the formation of a gel. As the gel forms, the fragrance and colorant if present are evenly distributed in the gel. Dependent upon the resin used, the particulate size thereof, the volume of water added, and the manner and duration of mixing, the consumer may obtain a variety of gel forms, ranging from a clear gel similar in appearance to a body of liquid, to a slushy mixture, or to container of crystal like, small "cubes" of gel. It is to be noted that no surfactant need be present in the gel resin system of the present invention, and that if a surfactant is present, the resultant gel tends to be cloudy rather than clear.

As previously indicated, the preferred hydrogel resin for the present invention comprises a polyacrylate polymer, preferably of the type used for super absorbents. Typical of such resins are Alcosorb G1 acrylic resin, available from Ciba Specialty Chemicals, of Suffolk Virginia, a cross-linked sodium polyacrylate polymer, having internal cross-linking only, and providing a high degree of swelling and rapid water release. Also available for the present invention, from Ciba, are Alcosorb G3, a double cross-linked polyacrylate polymer having both interior and exterior cross-linking, and Alcosorb AB3C, a copolymer of acrylamide sodium acrylate generally used as a flocculent, having larger particle size, in the range of from 800 to 1200 microns, which yields a large crystal like appearance after absorption of water. An additional suitable resin is sold by Ciba Specialty Chemicals under the trade name Gelling Agent #14, which is a white free flowing powder comprising a cross-linked sodium polyacrylate. It is to be noted that the particle size of such resins will affect the appearance of the finished gel air freshener. Small, powder sized resin will produce a Jello®-like gel, while larger particulate resins will produce a crystal like gel. Similar hydrogel forming resins are also available under various trade-names, such as Horta-Sorb®, from Horti-

cultural Alliance, Inc., of Sarasota, FL., Cabloc CT™ of Stochausen, Germany, and Hydrosorb™ from The Illinois Marketing Board. Further, the rate of absorbency of the resin is dependent upon the degree of cross-linking and particle size of the superabsorbent, with less cross linkage providing more rapid absorption, and more rapid release of water.

As an example of the above embodiment of the invention, a hydrogel air freshener kits were prepared, comprising a small plastic container containing 0.5 to about 2 grams of Alcosorb G3 sodium polyacrylate polymer resin, and a small vial containing from about 2 to about 8 grams of a liquid jasmine fragrance. The polyacrylate resin was premixed with about 0.04 weight percent of the coloring agent Red F-5B, from Clairiant. The resin and the fragrance were provided in a small candle jar, having a plastic lid. Upon opening of the lid and removal of the contents, the resin and fragrance were pre-mixed in the candle jar, followed by addition of about 150 cc of tap water. After about 1.5 minutes, a light red gel was formed, containing the fragrance. Water hardness will have an effect on the gelling time of the mixture, and to compensate for the variation in water hardness, 0.5 to 2 percent by weight of the desired air freshener weight should be used. The fragranced gel was left open to the atmosphere, with no cover, and the air freshening effect thereof was noticeable for an extended period of time. The finished gel may be contained in a variety of containers. The greater the surface area of gel exposed to the air, the stronger the fragrance strength, due to the greater number of fragrance molecules released into the atmosphere. Smaller mouth containers, on the other hand, will have a weaker fragrance strength, due to a lower evaporation rate, but a longer product life.

In another embodiment of the invention, a kit is provided to the consumer as set forth above, wherein the hydrogel resin is provided in the form of a sachet, characterized by having one way permeability to water, wherein the colorant and fragrance material are included within the sachet. For example, the fragrance may be provided as a solid particulate material, either crystalline or powder, or as a spray dried fragrance, either mixed with or upon the surface of the resin. Suitable forms of solid fragrance materials include spray dried powders, and

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encapsulated fragrances. Alternatively, the fragrance may be a liquid, included in a breakable container within the sachet, which the consumer may squeeze or flex to break open and release the fragrance. Upon addition of water to the sachet, a hydrogel rapidly forms, constrained by the packet. It is also possible for the packet to be such that it would be dissolved by the water, or easily torn apart by the expansion of the rapidly formed gel upon reaction of the resin and the water. Such a sachet may be provided with a suitable container into which the necessary amount of water may be poured by the consumer, or, alternatively, by itself for use in a container of the consumer's choice. As previously indicated, the container should be preferably of glass, or an inert plastic material which will not react with or be effected by the water, the resin, the resulting gel, any colorant present, or the fragrance material.

As an example of this embodiment of the invention, a sachet of sodium polyacrylate resin, comprising 0.5 to 2 grams of resin in a water insoluble cellulosic fiber packet was provided, with a spray dried fragrance comprising lemon oil absorbed in starch included, packaged in a candle jar as in the above example. The sachet was submerged in sufficient water in the candle jar to provide a water to resin ratio of about 150:1, for about 5 minutes, at which time the water and fragrance had been essentially absorbed by the resin, providing a fragrant gel air freshener. The gel was exposed to the atmosphere, and the fragrance was noticeable for a considerable number of days, during which time the gel dried and shrank. The gel was subsequently subjected to a soaking in additional water to attempt to regenerate the air freshener, which resulted in a regeneration of the gel, but only low notes of the fragrance were noted after removal of the gel from the water.

As an alternative of this embodiment, a water activated dye or coloring agent was printed on the surface of the sachet to serve as an indicator of usage. In this instance the color was vibrant when the sachet was wet, and almost colorless when dry.

In another form of the invention, a pad of material such as an absorbent cotton or other cellulosic or non-woven polyolefin material, may be coated or

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impregnated with a mixture of resin and fragrance, dried, and provided to the consumer in moisture resistant packaging. Such a pad need not be limited to cellulosic materials, but may include polyolefins, such as polyethylene, or polyesters. This pad may then be removed from the moisture resistant packaging, and
5 activated by spraying with water or immersion in water, to provide a hydrogel air freshener which will release fragrance over a period of time. After activation of the powdered gel, the pad may be placed in a location of the consumer's choice for extended air freshening.

As an example of this embodiment of the invention, a cellulosic pad,
10 comprising paper, was impregnated with polyacrylate polymer powder (Gelling Agent 14) and a spray dried lemon oil fragrance, in a non-aqueous carrier, dried, and set aside. After drying, the impregnated pad was placed in a beaker containing about ½ cup of water, and allowed to absorb the water and form a thickened pad of air freshener. The pad was then hung from a convenient location,
15 and provided air freshening for 10 to 30 days.

In still another form of the invention, a pad was coated with resin, with no fragrance, and dried. The pad was then placed in a small bowl, open to a controlled flow of water containing a water-soluble fragrance. Alternatively, the bowl was attached to a reservoir of fragrance solution having a controlled release
20 of solution equivalent to the evaporation rate of the liquid absorbed into the pad or hydrogel. This form of air freshener was found to have a life span determined by the volume of water and fragrance available. Since the hydrogel was not activated to form a gel until it was first contacted with the water, this pad provided a source of consistent fragrancing which was capable of being stored for an
25 extended period of time, and economically shipped, since there was no liquid present. Further, since the fragrance being emitted to the atmosphere was replenished by the addition of fresh fragrance-containing water, at the rate of fragrance evaporation, the air freshener provided consistent and fresh fragrance for as long a period as the source of liquid was available. Hence, the consumer
30 could purchase separate, and perhaps differing, containers of water and fragrance, and continue to obtain an air freshening effect indefinitely, by merely

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replacing the container of fragrance as it emptied.

These resin impregnated or coated pads were found to constitute very economical forms of air freshener devices, whether the fragrance was present in the pad, or in the liquid with which the pad was subsequently contacted by the consumer. Due to the fact that there was no liquid present in the pad, shipping costs were minimized. This form of packaging also permits great flexibility in terms of the product offered the consumer. By packaging the pad with a container for controlled contact with water, i.e. a metering bottle and tray into which the content of the water may be metered, and in which the pad may be located, the consumer may receive a totally dry system which may be opened, easily assembled, and activated by addition of water (or fragrance solution, packaged separately) to the metering bottle. In such case, pads may be sold separately, having various fragrances therein, so as to offer the consumer replacement pads of varying fragrance to be used with the reusable metering bottle and tray. Or, various solutions of differing fragrance may be offered to be utilized with gel impregnated pads (having no fragrance), so as to permit the consumer the opportunity to vary the fragrance as desired.

INDUSTRIAL APPLICABILITY

While the present invention has been described with respect to what is at present considered to be the preferred embodiments, it is to be understood that the invention is not to be limited to the disclosed embodiments. To the contrary, the invention is intended to cover various modifications and equivalent arrangements within the spirit and scope of the appended claims. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent formulations and functions.

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CLAIMS

1. A kit for the preparation of a fragranced hydrogel air freshener by the addition of water, said kit comprising a measured quantity of a hydrogel resin, and a measured quantity of fragrance material.
- 5 2. The kit of Claim 1, further comprising a container in which said measured quantities of resin and fragrance material may be mixed with water.
3. The kit of Claim 2, wherein said hydrogel resin comprises a sodium
10 polyacrylate polymer.
4. The kit of Claim 2, wherein said resin and fragrance are packaged separately for mixing prior to addition of water.
- 15 5. The kit of Claim 4, further comprising a coloring agent.
6. The kit of Claim 4, wherein said fragrance is a liquid fragrance.
7. The kit of Claim 6, wherein said fragrance is a liquid enclosed within a
20 breakable container.
8. The kit of Claim 2, wherein said resin and said fragrance are both solid.
9. The kit of Claim 8, wherein said fragrance is bonded to the surface of said
25 resin.
10. The kit of Claim 1, wherein said resin and said fragrance are provided as a sachet.
- 30 11. The kit of Claim 10, wherein said sachet contains particulate acrylic acid polymer and a fragrance material, and said sachet is characterized by one

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way permeability to water.

12. The kit of Claim 11, wherein said acrylic acid polymer is a sodium polyacrylate polymer.
- 5 13. The kit of Claim 11, further comprising a coloring agent.
14. The kit of Claim 10, wherein said fragrance material is particulate.
- 10 15. A kit for the preparation of a fragranced hydrogel air freshener, said kit comprising a pad impregnated with sodium polyacrylate polymer, said kit being activated by the controlled addition thereto of a water solution of fragrance.
- 15 16. A kit as set forth in Claim 15, further comprising a container for providing a controlled flow of said water solution to said pad so as to provide a consistent dispensing of fragrance.
- 20 17. A kit as set forth in Claim 16, wherein said pad is a replaceable element of said kit.
- 25 18. A kit for the preparation of a fragranced hydrogel air freshener, said kit comprising a pad impregnated with sodium polyacrylate polymer and a fragrance, said kit being activated by the controlled addition thereto of water.
19. A kit as set forth in Claim 18, further comprising a container for providing a controlled flow of said water solution to said pad so as to provide a consistent dispensing of fragrance.
- 30 20. A kit as set forth in Claim 19, wherein said pad is a replaceable element of said kit.

INTERNATIONAL SEARCH REPORT

 In International Application No
 PCT/US 01/07558

A. CLASSIFICATION OF SUBJECT MATTER		
IPC 7	A61L9/04	A61L9/012 A61L9/12 A61L9/05
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC 7 A61L A01M		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 835 666 A (SANYO CHEMICAL IND LTD) 15 April 1998 (1998-04-15) cited in the application claims; figures & US 5 904 028 A 18 May 1999 (1999-05-18) cited in the application	1-10
A	TANAKA T: "WPI WORLD PATENT INFORMATION DERWENT,GB,DERWENT", WPI WORLD PATENT INFORMATION DERWENT,GB,DERWENT, VOL. 1984, NR. 36 XP002141600 abstract	1-20
A	TANAKA Y: "WPI WORLD PATENT INFORMATION DERWENT,GB,DERWENT", WPI WORLD PATENT INFORMATION DERWENT,GB,DERWENT, VOL. 1982, NR. 18 XP002141602 abstract	1-20
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
* Special categories of cited documents : *A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art *&* document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
19 July 2001		26/07/2001
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax. (+31-70) 340-3016		Authorized officer ESPINOSA, M

INTERNATIONAL SEARCH REPORT

Int'l Application No
PCT/US 01/07558

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EARTH SEIYAKU KK: "WPI WORLD PATENT INFORMATION DERWENT,GB,DERWENT" , WPI WORLD PATENT INFORMATION DERWENT,GB,DERWENT, VOL. 1983, NR. 22 XP002141601 abstract	1-20
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